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(54) Forwarding of IP packets for routing protocols

(57) A forwarding engine of a router device may replace addresses of some IP packets by virtual ones such to mask the active routing daemon. This is used in unicast regime when said forwarding engine forwards incoming IP packets from neighbor routers to said routing daemon. It is also used in unicast as well as in multicast regime in the opposite case. A standby routing daemon may also be used on another processor by affecting same virtual addresses for its ports as the first active routing daemon. In a case of failure of the first active routing daemon, a controller will switch said standby routing daemon to be the new active daemon connected to the forwarding engine. A CompactPCI (Peripheral Component Interconnect) bus can be advantageously used. In that case, the forwarding engine is a peripheral board of the controller of that CompactPCI.

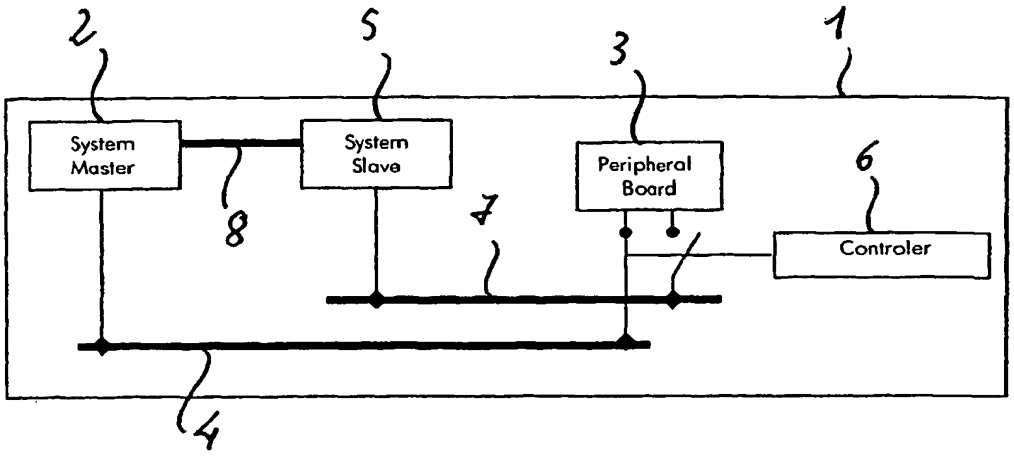

Figure 1

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[0010] In another embodiment, a standby routing daemon is advantageously used on another processor by affecting same virtual addresses for its ports as the first active routing daemon. In a case of failure of the first active routing daemon, a controller will then switch said standby routing daemon to be the new active daemon connected to the forwarding engine.

[0011] In a further embodiment, it is taken advantage of the use of a CompactPCI (Peripheral Component Interconnect) bus. In that case, the forwarding engine is a peripheral board of the controller of the CompactPCI. And the processors on which the routing daemon are running are directly connected to that CompactPCI bus.

[0012] Further advantageous features of the invention are defined in the dependent claims and will become apparent from the following description and the drawings.

[0013] One embodiment of the invention will now be explained in more details with reference to the accompanying drawings, in which:

Fig. 1 is a schematic view of an hardware architecture according to the invention;

Fig. 2 is a schematic view of control packets flows.

[0014] On figure 1 is depicted a router device 1 usually with several outgoing (Input/Output) ports and connected to some network for forwarding IP packets. Such router device 1 contains a processor board 2 on which is running an active routing daemon - system master. This processor board 2 is directly connected through some bus 4 to a forwarding engine 3 - peripheral board.

[0015] The forwarding engine 3 is set such that it forwards incoming IP packets from neighbor routers to said active routing daemon or outgoing IP packets from said active routing daemon to neighbor routers. This can occur mainly in two different modes i.e. in unicast or multicast, latter encompassing broadcast mode. In the later protocol IPv6, it exists also anycast mode which is encompassed in the present invention by unicast. Unicast mode means that a communication occurs via a point-to-point communication. Anycast refers to the ability of a device to establish a communication with the closest member of a group of devices, in our cases routers of a network. By way of example, a host might establish a communication with the closest member of a group of routers for purposes of updating a database like a routing table. That router would then assume responsibility for retransmitting that update to all members of the router group on the basis of a multicast. More generally, multicast mode is the case when a broadcasting of messages is performed to a selected group of devices on a LAN, WAN or the Internet. It is a communication between a single device and multiple members of a device group.

[0016] According to the present invention, the forwarding engine 3 when forwarding incoming IP packets from neighbor routers to the routing daemon - system master -, will replace in unicast regime destination addresses of its outgoing ports in IP packets with virtual one of said active routing daemon. And when forwarding outgoing IP packets from said routing daemon to neighbor routers, will replace in unicast as well as multicast regimes, virtual source addresses of said active routing daemon in IP packets with the addresses of its outgoing ports.

[0017] Usually, the addresses which are of concern in the present invention - not exclusively - are the IP addresses and/or the MAC (media access control) addresses. An IP address is a network layer address for a device operating in the IP suite of protocols. The IP address is typically a 32 bit field or even 128 bit under IPv6, at least a portion of which contains information corresponding to its particular network segment. A MAC address is an address of a device at the sublayer of the data link layer. It is generally intended to apply to a specific physical device no matter where it is plugged into the network. Thus, a MAC address is generally hard-coded into the device - on a router's ROM, for example. In the present case, the addresses which are replaced by the forwarding engine (3) will be preferably the IP- and/or MAC addresses.

[0018] In figure 1 is furthermore pictured the router device 1 with a second processor board 5 - system slave - on which is running a standby routing daemon. The second processor board 5 is firstly connected to the processor board 2 via a specific bus connection 8. All the updates of the database will occur through such bus connection 8, particularly the routing table allowing in case of necessity a very fast takeover of the standby routing daemon to become the new active routing daemon. This takeover is performed by a controller 6 which is connected with the bus 4 as well as a specific bus 7 directly connected with the second processor board 5. In case of a failure of the active routing daemon, the controller 6 will switch the standby routing daemon to be the new active daemon connected then via its specific bus 7 to the forwarding engine 3. The previously active daemon may then become the new standby routing daemon if the failure was not irreversible. If necessary, the previously older active daemon can be disconnected from the forwarding engine 3 by the controller 6 almost at the same time as the standby daemon is connected to the forwarding engine 3. In any case, the takeover will take only few ms which has to be compared with the 30 to 90 s in previous cases, it means almost no lost of packets to be forward will be noticed.

[0019] Instead of using two different routers for the active as well as the standby supervisor engine, it may be of interest to use two different system boards of the same CompactPCI (Peripheral Component Interconnect). This will substantially lower the price of such architecture. In that case, the two processor boards 2 and 5 on figure 1 are two system boards of this CompactPCI, the controller 6 is the controller of this CompactPCI and the forwarding engine 3 is a peripheral forwarding of that

8. Method for forwarding incoming IP packets from neighbor routers to some active routing daemon or outgoing IP packets from said active routing daemon to neighbor routers by a forwarding engine (3) containing at least two outgoing ports and connected to some router device (1) for IP routing containing said active routing daemon running on a processor board (2) while when forwarding said incoming IP packets in unicast regime, destination addresses of said outgoing ports in IP packets are replaced by virtual one of said active routing daemon or when forwarding said outgoing IP packets in unicast as well as multicast regimes, virtual source addresses of said active routing daemon in IP packets are replaced with the addresses of said outgoing ports.

9. Method according to claim 8 **characterized in, that** the replaced addresses are the IP- and/or the MAC (media access control)-addresses.

10. Method according to claim 8 **characterized in, that** in case of a failure of said active daemon a switch occurs to a standby routing daemon running on an another processor board (5) and affected with same affected virtual addresses for its ports as said active routing daemon, while said standby routing daemon being the new active daemon connected to said forwarding engine (3).

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 44 0368

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	EP 0 605 339 A (IBM) 6 July 1994 (1994-07-06) * column 7, line 43 - column 8, line 20; figure 2 * * column 11, line 49 - column 12, line 3 * * column 13, line 49 - column 14, line 3 * * column 16, line 28 - column 18, line 18; figures 58,6 *	1,2,8,9	H04L12/56 H04L29/12 H04L29/06
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 July 2002	Perrier, S

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82